**Course Code** : **CS-60**
**Course Title** : **Foundation Course in Mathematics in Computing**
**Assignment Number** : **BCA-60/ Project/07**

**Question 1:** Find all the sixth roots of (12+5i).

**Ans:** ˥z = 12 + 5i

I Polar form

$z = r(\cos\theta + i\sin\theta)$

where $r = \sqrt{a2+b2}$ , $\theta = \tan^{-1}(b/a)$

(z = a+ib)

where a = 12, b= 5

$r = \sqrt{a^2+b^2} = \sqrt{144+25} = \sqrt{169} = 13$

where a = 12, b = 5

$r = \sqrt{a2+b2} = \sqrt{144 + 25} = \sqrt{169} = 13$

$q = \tan^{-1}(b/a) = \tan^{-1}(5/12) = \tan^{-1}(.4166)$

$q = 22.61$

$z = 13 [\cos(22.61) + I \sin(22.6)]$

$z = 13 [\cos(2k\pi + 22.61) + i \sin(2k\pi + 22.61)]$

$6^{th}$ (root's) both sides

$z\ 1/6 = 3^{1/6} [\cos(2k\pi + 22.61) + i \sin(2k\pi + 22.61)]^{1/6}$

Apply the Demover's Memory

$$z^{1/6} = 13^{1/6} \left[\cos\left(\frac{2k\pi + 2.61}{6}\right) + i \sin\left(\frac{2k\pi + 22.61}{6}\right)\right]$$

where k = 9, 1, 2, 3, 4, 5

Hence Root's are

K = 0 $z^{1/6} = 13^{1/6} \left[\cos\left(\frac{22.61}{6}\right) + i \sin\left(\frac{22.61}{6}\right)\right]$

K=1 $z^{1/6} = 13^{1/6} \left[\cos\left(\frac{2\pi+22.61}{6}\right) + i \sin\left(\frac{22.61+2\pi}{6}\right)\right]$

K= 2 $z^{1/6} = 13^{1/6} \left[\cos\left(\frac{4\pi+22.61}{6}\right) + i \sin\left(\frac{4\pi+22.61}{6}\right)\right]$

K= 3 $z^{1/6} = 13^{1/6} \left[\cos\left(\frac{6\pi+22.61}{6}\right) + i \sin\left(\frac{6\pi+22.61}{6}\right)\right]$

K= 4 $z^{1/6} = 13^{1/6} \left[\cos\left(\frac{6\pi+22.61}{6}\right) + i \sin\left(\frac{6\pi+22.61}{6}\right)\right]$

K= 5 $z^{1/6} = 13^{1/6} [\cos(8\pi+22.61) + i \sin(8\pi+22.61)]$

K= 6 $z^{1/6} = 13^{1/6}\left[\cos\left(\frac{10\pi+22.61}{6}\right) + i\sin\left(\frac{10\pi+22.61}{6}\right)\right]$

**Question 2:** If α, β, γ are the roots of the equation

$x^3 - 7x^2 + x + 5 = 0,$

find the equation whose roots are

$\alpha^2 + \beta^2, \beta^2 + \gamma^2, \gamma^2 + \alpha^2.$

Ans: $x^3-7x^2+x+5 = 0$

α, β, γ are root's

$\alpha+\beta+\gamma = 7$ (1)

$\alpha\beta+\beta\gamma+\gamma\alpha = 1$ (2)

$\alpha\beta\gamma = 5$ (3)

We have to find the eq$^n$ where roots are $\alpha^2+\beta^2, \beta^2+\gamma^2, \gamma^2+\alpha^2$

Now

$(\alpha+\beta+\gamma)^2 = \alpha^2+\beta^2+\gamma^2 + 2(\alpha\beta+\beta\gamma+\alpha\gamma)$

$7^2 = \alpha^2+\beta^2+\gamma^2 + 2(1)$

$\alpha^2+\beta^2+\gamma^2 = 49-2 = 47$

$\alpha^2+\beta^2+\gamma^2 = 47$ -----(4)

$(\alpha^2+\beta^2) + (\beta^2+\gamma^2) + (\gamma^2+\alpha^2)$

$= 2(\alpha^2+\beta^2+\gamma^2) = 2\times 47 = 94$

$(\alpha^2+\beta^2) + (\beta^2+\gamma^2) + (\gamma^2+\alpha^2) = 94$ ---(5)

$(\alpha^2+\beta^2)(\beta^2+\gamma^2) + (\beta^2+\gamma^2)(\gamma^2+\alpha^2)+(\alpha^2+\beta^2)(\beta^2+\gamma^2)$

$\alpha^2+\beta^2+\gamma^2 = 47$

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**Question 3:** Evaluate: $\int \tan^{-1} x \, dx.$

Ans: $I = \int \tan^{-1}x \, dx$

$I = \int 1. \tan^{-1}x \, dx$ (ICATE)

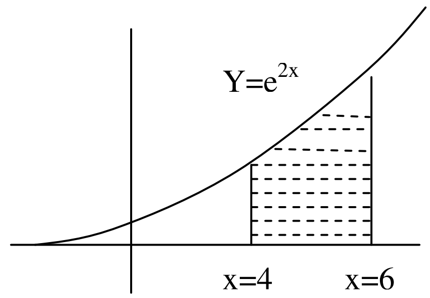
I = tan-1x ∫1.dx - ∫ 1/(1+x2). X dx

I =$x.\tan^{-1}x - \frac{1}{2} \log |1+x^2| + c$

**Question 4:** Find the area bounded by the x-axis, the curve $y = e^{2x}$ and the ordinates $x = 4$ and $x = 6$.

**Ans:** $y = e^{2x}$ coordinate $x = 4, x = 6$

we have to find the area.




$$\text{Area} = \int e^{2x}\,dx$$

$$= [\,e^{2x}/2]_4^6$$

$A = ½\,[e^{12} – e^8]$ Ans

$A = ½\,[162,\ 754.80 – 2980.95]$

$A = ½\,[159,\ 773.85] = 79886.925$

**Question 5(a):** Find the equation of the line joining the points

(7, 9, −3) and (11, −5, −2).

Ans: P(7,9,-3) Q (11, -5, -2)

Required Eq$^n$ Line (PQ)

$$\frac{x-7}{11-7} = \frac{y-9}{-5-9} = \frac{3+3}{-2+3}$$

$$\frac{x-7}{4} = \frac{y-9}{-14} = \frac{3+3}{1}$$

**(b)** Find the equation of the sphere, which contains the circle

$x^2 + y^2 + z^2 = 16,\ 3x + 3y + 3z = 17$ and

passes through the origin.

**Ans:** $x^2+y^2+z^2 = 16, 3x+3y + 3z = 17$

Let the eqn of sphere be

$(x^2+y^2+z^2-16) + k(3x+3y+3z-17) = 0$

where k is the consistent & k ∈

Since it passes through origin (0, 0, 0) then

$(0-16) + k(0-17) = 0$

$-16-17k = 0$ ➔ $-17k = 16$

➔ $k = -16/17$

Now

$(x^2+y^2+z^2-16) - 16/17\ (3x+3y+3z-17) = 0$

$17x^2 + 17\ y^2 + 17z^2 - 272 - 48x - 48y - 48z + 272 = 0$

$17x^2 + 17y^2 + 17z^2 - 48x - 48y - 48z = 0$